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TITLE IEA Six-Subject Survey Instruments: Reading Comprehension Tests.

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ABSTRACT

In 1965 the International Association for the Evaluation of Educational Achievement (IEA) inaugurated a cross-national survey of achievement in six subjects: Science, Reading Comprehension, Literature, English as a Foreign Language, French as a Foreign Language, and Civic Education. The overall aim of the project was to use international tests in order to relate student achievement and attitudes to instructional, social, and economic factors, and from the results to establish generalizations of value to policy makers worldwide. Contained here are six tests measuring Reading Comprehension (populations I, II, IV); and one test measuring reading speed (populations I, II). Population I consists of students aged 10 to 11 years; population II, 14 to 15 years; and population IV, students enrolled in the final year of pre-university training. Some answer keys and statistical data can be found in ED 084 503. (RC)

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The basic procedures to be followed in the main testing of the IEA Six-Subject Survey were set out in a series of manuals:

Stage 2 IEA/M1 Manual for National Centers
IEA/M2 Manual for School Coordinators
IEA/M3 Manual for Test Administrators

Stage 3 IEA/M1/Stage 3 Manual for National Centers
IEA/M2/Stage 3 Manual for School Coordinators
IEA/M3/Stage 3 Manual for Test Administrators

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4 = IV	9 = IV Specialist
5 = I and II	X = EA: Teacher or School questionnaire

3: Subject

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4-5: Instrument Within Type

One or two characters used when necessary to uniquely identify each instrument when there is more than one instrument of the same type.

Instrument Name Reading Comprehension Test - Section C

Data Bank Instrument Number RIEC

TM 004 141

SECTION C

[illegible]

Please continue

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10. In describing the dogs, the writer tries to make them seem
    A. brave.
    B. strong.
    C. well-trained.
    D. savage.

11. In saying that Ernenek's igloo was "at the top of the world", the writer means that it was
    A. on the icy ocean.
    B. near the North Pole.
    C. far from any other home.
    D. very small and unimportant.

12. We can tell from the fourth paragraph that
    A. It was a really hot day.
    B. Ernenek hated to run.
    C. Ernenek got cold easily.
    D. Ernenek was used to very cold weather.

Please continue

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Simonides was a poet. He wandered round the wealthy cities of Asia, composing poems and singing the praises of warriors for such reward as he could gain. By this means he gathered a considerable amount of wealth, and after some years he made up his mind to return by sea to his native island of Ceos. While he was on the ship, a dreadful storm arose, and all the passengers began in panic to gather together their precious belongings.

Simonides stood on the deck calmly, making no effort to gather up his own baggage. Some of the other passengers were amazed at this, and one of them asked Simonides why he was not trying to save any of his property. "All my real wealth", said Simonides, "is in my head". The others laughed at the foolish poet, and as the ship foundered they leapt into the sea weighed down with all their possessions. Some of them attempted to carry such heavy burdens that they drowned. Others managed to struggle ashore. But here they were set upon by thieves, who stripped them naked of all that they owned.

Simonides, meanwhile, made his way to the nearest town, without being robbed, since he had nothing for the thieves to take. No sooner was he in the streets than he was recognized by a lover of his poetry, and showered with clothes, gifts and hospitality.

Next day, as he was walking with some of his new friends and admirers, Simonides happened to see some of his fellow travellers, who were begging for food and shelter. As soon as he saw them, Simonides said, "You see, you laughed at me on the ship when I said that my real wealth was in my head. But now you are beggars while I am well clothed and on my way to being prosperous again; now I can help you. What you have tried to save is all lost. But I carried my riches along with me - my poems".

13. Simonides had made his living by composing poems that told of
    A. the beauty of nature.
    B. life on the sea.
    C. life in ancient times.
    D. the great deeds of warriors.

14. The other passengers laughed at Simonides because he
    A. had no baggage.
    B. did not try to save his possessions.
    C. was so frightened of the storm.
    D. read poems during the storm.

15. The thieves did not rob Simonides because he
    A. was recognized by them.
    B. had no possessions.
    C. made poems for them.
    D. was able to escape them.

Please turn over and continue

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16. What suggests that Simonides' poems were not written down?
    A. He said his real wealth was in his head.
    B. He did not try to gather his belongings.
    C. They had to do with the deeds of warriors.
    D. No one recognized his poetry.

17. When Simonides said "my real wealth is in my head", he meant
    A. by his knowledge he could earn new wealth.
    B. beauty is more important than mere possessions.
    C. he had very little that he owned.
    D. he was a very intelligent man.

18. The idea that the writer of this story is trying to get over to us is that
    A. possessions are of no value.
    B. life is dangerous and uncertain.
    C. poetry may be wealth.
    D. poetry is beautiful

19. In this story, the author's main purpose is to
    A. entertain his reader.
    B. write very beautifully.
    C. weave a lesson into the story.
    D. give some useful information.

Please continue

Before the advent of hunters with guns, the musk ox was king of the tundra. His heavy coat protected him against the cold of winter and the swarms of bloodsucking insects in summer. With his heavy horns he could break the ice crusts that covered the willow branches he was so fond of. When danger threatened, the bulls lined up before the cows and their young with their strong, sharp horns they were more than a match for wolves or hunters with primitive weapons. But when they lowered their heads and charged they made an easy target for a huntsman with a gun. And so now there are only about seven thousand musk oxen.

20. The word "advent" in line 1 most nearly means
A. report.
B. attack.
C. ending.
D. arrival.

21. **If a hunter went to hunt the musk ox in summer, the worst trouble he would face would be**
A. wolves.
B. insects.
C. the charge of the bulls.
D. a chance of frost-bite.

22. The last sentence**s suggest that**
A. the musk oxen are dying off.
B. the musk ox is a stupid animal.
C. the musk ox cannot survive in today's world.
D. hunters are killing too many musk oxen.

23. The musk ox lives in the
A. far North.
B. desert.
C. jungle.
D. mountains.

24. The writer's feelings about the musk ox can best be described as
A. fear of such a powerful animal.
B. eagerness to go and hunt one.
C. interest in their care for their young.
D. concern that they may all be killed.

END OF SECTION D

DO NOT TURN OVER UNTIL YOU ARE TOLD TO DO SO

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Stage 2 IEA/TC Manual for National Centers
IEA/SC Manual for School Coordinators
IEA/TA Manual for Test Administrators

Stage 1 IEA/TC/Stage 1 Manual for National Centers
IEA/SC/Stage 1 Manual for School Coordinators
IEA/TA/Stage 1 Manual for Test Administrators

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5 = I and II	A = EA: Teacher or School questionnaire

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4-5: Instrument Within Type

One or two characters were given necessary to uniquely identify each instrument when there is more than one instrument of the same type.

Instrument Name Reading Speed Practice Test, Section 2 and Reading Speed Test

Data Bank Instrument Number RSP and RSA

Note: Both the practice and the actual tests are included

[illegible]

(a) [illegible] [illegible] [illegible]

(b) [illegible] [illegible] [illegible]

(c) [illegible] [illegible] [illegible]

(d) [illegible] [illegible] [illegible]

(e) [illegible] [illegible] [illegible]

(f) [illegible] [illegible] [illegible]

(g) [illegible] [illegible] [illegible]

(h) [illegible] [illegible] [illegible]

(i) [illegible] [illegible] [illegible]

(j) [illegible] [illegible] [illegible]

(k) [illegible] [illegible] [illegible]

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BOOKLET 3J

READING SPEED TEST

Directions

Here is a story. The story has many little parts. When you come to the end of a part there will be three words like this:

one two three

Put a line under the word that fits in the story. For this test you underline the words in the booklet.

Read as fast as you can, and see how many parts of the story you can read and mark in the time that you have.

Remember - read as fast as you can, but be sure to mark the right word after each part of the story.

Do not use an eraser. If you change your mind, cross out your first answer and then put a line under your second choice.

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IEA/3J

1. Peter has a little dog. The dog is black with a white spot on his back and one white leg. The color of Peter's dog is mostly

black brown grey

2. When Peter got the dog it was a small puppy. Now the dog is a little more than two years old. How many years has Peter had the dog?

one two three

3. Peter's dog has a spot on his back. That is why Peter named the dog Spot. The dog was named after the spot on his

back ear leg

4. The dog has learned to do two tricks. One trick is to catch a ball. To stand on its hind legs is the second

story trick way

5. When he was a puppy Spot was fed three times a day. Now he is fed only once. The number of times is now

often less many

6. Spot is most happy when he gets a bone. He would like to have a bone every day, but he does not get one that

small hungry often

7. Spot lives in his own little house. It is a red house and it is made of wood. The house that Spot lives in is

green red white

8. Peter's mother does not like to have Spot in her house when he has dirty feet. When his feet are dirty Spot must stay

inside hungry outside

9. Sometimes Peter has dirty feet too. Then his mother makes him wipe them off on the mat. The mat is used to keep the house

clean dry warm

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10. Peter likes to play with Spot. Often they run together. Peter can run quite fast, and yet Spot can run

faster now home

11. One day Peter went for a long walk. Spot came along too. Spot had great fun. When Peter goes for a walk Spot always wants to

eat go sleep

12. While they were walking they saw a bird. The bird was sitting on the ground under a tree. Peter saw the bird sitting on the

branch ground tree

13. Spot saw the bird too. Spot wanted to catch the bird. The bird was something that Spot wanted to

catch find scare

14. Spot ran after the bird. While he ran after the bird he kept barking. Spot was barking while he chased the

ball bird boy

15. When Spot chased the bird it flew away. It flew up into the tree. It flew to the top of the tree and sat on a

branch store box

16. Spot was surprised. He did not know where the bird had gone. He did not know that the bird had flown to the

bush house tree

17. Spot ran around in circles. He ran this way and that way. He kept looking and looking. He was looking for the

bird bone dog

18. The bird in the top of the tree started to sing. He sang because he was happy. Because he was safe in the tree he started to

fly sing sleep

19. A second bird came to the tree too. He came to join the first bird. How many birds were there in the top of the tree now?

none one two

20. The birds flew away from the tree together. They flew to a field of wheat. The birds were hungry and wanted to eat some

berries corn wheat

TURN THE PAGE

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21. There were many birds in the field. They were all eating the grains of wheat. They were all eating the wheat in the

box field house

22. Spot and Peter came walking by the field. When Spot saw the birds, he was very excited. He was excited to see so many

birds grains people

23. Spot ran into the field. When he got to the middle of the field, he started to bark. He stood barking in the middle of the

day field night

24. The birds did not wait for Spot. Before he reached the field they flew away. They flew away because they were

afraid alone hungry

25. Spot did not know what to do next. He sat barking in the middle of the field. He sat and waited for Peter to

bark come cry

26. Peter came to the edge of the field and stood still. Then he called to Spot. He called to Spot from the edge of the

field road river

27. When Peter called, Spot ran over to him. Peter patted Spot on the head. Because Spot obeyed Peter, Peter thought he was a good

boy dog fighter

28. They walked until they came to the main road. There they saw a bus come by loaded down with people. There were a great many people in the

bus house town

29. The bus was going to the next town. In this town there is a large market. Many people ride the bus to go to the

lake market station

30. Peter saw his father on the bus. Peter's father works in the next town. He has to ride the bus when it is time to go to

bed visit work

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31. Peter walked along the road with Spot. They met another dog on the road. Spot growled and growled at the other dog. Spot was not

greedy friendly lonely

32. The other dog started to growl too. But then he turned and ran away. He was afraid of Spot. The other dog was not very

hungry brave sad

33. Peter and Spot came to a bridge across a stream. Peter got some small stones from the side of the road. He threw them into the

lake puddle stream

34. Spot saw Peter throw a stone. He started to run after the stone. He did not see the strear. He fell into the

hole mud water

35. Spot started to swim. He swam across the stream and came out the other side. Then he ran back to Peter across the

bridge lake field

36. Spot was all wet. He started to shake himself. He shook himself right beside Peter. When he shook himself, it made Peter

glad hot wet

37. Peter stood in the middle of the bridge and watched the stream. He saw something small swimming in the stream. He thought it was a

boat boy fish

38. Now it was time for Peter to go home. There was some work to do at home. Peter often did work in the garden. He was a very good

cook gardener tailor

39. Peter and Spot hurried home. Peter's mother was waiting by the door. She had some gardening to be done, so she was glad to see

sunshine Peter Spot

40. Peter hurried to get his work done. His mother had promised him some candy when he was finished. He wanted to finish so he could get the

ball candy money

IEA SIX-SUBJECT SURVEY INSTRUMENTS

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Stage 1 IEA/01 Manual for National Centers
IEA/02 Manual for School Coordinators
IEA/03 Manual for Test Administrators

Stage 2 IEA/01/Stage 2 Manual for National Centers
IEA/02/Stage 2 Manual for School Coordinators
IEA/03/Stage 2 Manual for Test Administrators

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4-5 Instrument Within Type

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Instrument Name Reading Comprehension Test - Section C

Data Bank Instrument Number 0240

If you were to begin to enumerate the various uses of paper, you would find the list almost without end. Yet, there was a time when this familiar item was a precious rarity, when the sheet of paper you now toss into the wastebasket without thinking would have been purchased at a great price and carefully preserved. Indeed, for long centuries in man's history, paper was unknown. People wrote on specially prepared sheepskins or goatskins called parchment.

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About twenty-two hundred years ago, the Chinese people discovered how to manufacture paper from wood pulp. Later the secret reached Europe. But for many years, the whole operation was done by hand. Imagine making paper by hand, sheet by sheet! It was a reasonably simple process, but it is easy to see why paper was used only by the wealthy.

The first machine for making paper was invented by a Frenchman named Louis Robert. It was a crude machine by today's standards. Many European and American inventors have since contributed to the development of the more efficient papermaking machines now in use. In our time, paper is used throughout the world.

21. A long time ago people used parchment to write on because
    A. parchment lasted a long time.
    B. paper was unknown.
    C. paper tore too easily.
    D. parchment could be prepared easily.

22. The process of making paper was first discovered by
    A. an American.
    B. the French.
    C. the Chinese.
    D. Louis Robert.

23. Why was the process of making paper by hand unsatisfactory?
    A. It was too complicated.
    B. The paper was of poor quality.
    C. It was too slow.
    D. It was a secret.

24. We may conclude that, after Robert's invention, paper became
    A. cheaper.
    B. more valuable.
    C. stronger.
    D. rarer.

25. The main point that is being brought out by the first paragraph of this story is that
    A. it is only recently that paper has been widely available.
    B. for some uses parchment is better than paper.
    C. one can invent many different uses for paper.
    D. one should not throw paper in the waste basket.

26. The person who wrote this story was trying to
    A. amuse us.
    B. help us to learn something new.
    C. change how we feel about something.
    D. write something very pretty.

END OF SECTION D

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IEA/M3/Stage 3 Manual for Test Administrators

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Instrument Name Reading Comprehension Test - Section D

Data Bank Instrument Number E2RD

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"From your large envelope take out Booklet 7 and your pink answer card 7. You are going to take another test to find out how well you read. [See instrument number E2RC for information about the instructions given for the test just prior to this one] The answers to the questions will be marked in Section D of your answer card. Although there are 29 questions on the answer card there are only 26 questions in the Section. You should therefore leave questions 27, 28 and 29 blank. Turn to Section D of your booklet. You will have fifty minutes to do this test. Are there any questions?"

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IEA/7 D

SECTION D

E2RD

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Deep silence reigned over the camp; only the guards were awake. Wrapping his warm cloak closely about him, a sentry on the furthest outpost stamped restlessly. His attention was caught by furtive shadows moving between him and the first grey light and he sensed approaching danger. The alarm was still ringing clear from his bugle as the company of the Legion seized their rifles and fell into battle order. There was no confusion, only an almost incredible quickness and speed. The square was formed about the well with the camels sheltered in the middle and the guns placed at the corners. A few signal shots were fired and the sentries fell back on the main body of the troop. All night the enemy had been gathering silently behind the encircling dune and now, with lance and sword, they charged from the surrounding crests. Three sides of the square stood firm; the fourth wavered and broke. The enemy poured into the square, stampeding the camels and stabbing the men in the back.

1. The attack took place in a
   A. forest.
   B. desert.
   C. small town.
   D. mountain pass.

2. The attack took place just at
   A. daybreak.
   B. midnight.
   C. nightfall.
   D. the rise of the moon.

3. We can tell that the night was
   A. hot.
   B. cold.
   C. stormy.
   D. moonlit.

4. The camels were mostly
   A. killed.
   B. seized.
   C. ridden away.
   D. driven off.

5. The camping place was located
   A. on a hillside.
   B. on high ground.
   C. in a hollow.
   D. away from the water.

6. After the alarm was sounded, the sentries
   A. came in to the rest of the troop.
   B. ran away in fright.
   C. kept firing at the enemy.
   D. blew their bugles.

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In their first experiments the researchers let the camel have no water in eight days. It lost about 22% of its weight, about 100 kilos. When it finally was given water to drink it emptied one bucket after another, got rounder and rounder and soon returned to its normal condition. A camel can lose anything up to 25% of its weight through evaporation without any danger of losing its life. However, a loss of weight of 12% causes a man to die in a desert. The researchers, who were fond of animals, did not dare to find out how long a camel can stay alive without water. The camel that went longest without water drank 135 litres of it in 13 minutes after 17 days without a drink.

A camel can manage with a small amount of water better than a man can. And furthermore, it can regulate its perspiration much better than we can. If we are compelled to stay in a temperature higher than our normal body temperature, we start to perspire in order to prevent the temperature of our organs from becoming dangerously high. A camel's temperature regulation is different. When the sunshine becomes hotter and hotter the body temperature of the camel follows the temperature of the environment. Only when the body temperature has risen to 41 degrees does a camel begin to perspire. When the cold night of the desert arrives a camel's temperature sinks to 34 degrees. This variation of 6 degrees means that it takes quite a long time in the daytime before a camel starts perspiring.

7. The purpose of this passage is chiefly to explain why a camel
   A. can lose so much weight.
   B. can drink so much water.
   C. does not perspire so much.
   D. is so well suited to the desert.

8. In saying that camels "can regulate perspiration much better than we can", the author means that the camel
   A. can turn his perspiration off and on as he wishes.
   B. has more sweat glands than we have.
   C. responds to smaller changes in temperature.
   D. does not start to perspire as soon as we do.

9. The function of perspiration in man is to
   A. prevent a drop in body temperature.
   B. regulate the body temperature.
   C. let fluid from the body.
   D. remove salt from the body.

10. When the temperature of the air rises above 34°C a camel starts
   A. perspiring heavily.
   B. saving energy.
   C. showing a higher body temperature.
   D. regulating its drinking of water.

Please turn over and continue

11. The relation between the first and second paragraphs of this article is that the second paragraph

A. calls evidence the results reported in the first.

B. gives further details about the results reported in the first.

C. is more specific than the first in the information it provides.

D. presents a different point of view from the first.

12. Judging from the passage, there has been [illegible] a week ago?

A. 500 kilograms.

B. [illegible] kilograms.

C. 1000 kilograms.

D. There is no way of telling.

Please continue

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

11. In the paragraph that follows this one or in items 12(c) [illegible] the author will:
    a. [illegible]
    b. [illegible]
    c. [illegible]
    d. [illegible]

12. The author's style is best described as
    a. [illegible]
    b. [illegible]
    c. [illegible]
    d. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

1. [illegible]
   a. [illegible]
   b. [illegible]
   c. [illegible]
   d. [illegible]
   e. [illegible]

2. [illegible]
   a. [illegible]
   b. [illegible]
   c. [illegible]
   d. [illegible]

3. [illegible]
   a. [illegible]
   b. [illegible]
   c. [illegible]
   d. [illegible]

4. [illegible]
   a. [illegible]
   b. [illegible]
   c. [illegible]
   d. [illegible]

[illegible]

[illegible]

[illegible]

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During the present century, scientific study of man's surroundings and experiences is commonly accepted as the desirable way to determine the truth or falsity of statements, opinions, or beliefs.

This was not always so. During past centuries there was much reliance on authority. The opinions expressed by persons in positions of authority and the written statements in approved documents were frequently accepted and taught as oracles of truth. Those questionning the accuracy or validity of these opinions were in grave danger. Many persons, later recognized as leading contributors to the progress of mankind, suffered torture, imprisonment, and even death because they dared to question beliefs or opinions which we now see to have been demonstrably false.

The scientific method emphasized the inductive rather that the deductive approach to the solution of problems. The inductive method is characterized by observations, measurement, definitions, enumerations, classification, and the formulation of conclusions on the basis of objective evidence. On the other hand, authoritarianism utilized the deductive method, namely, reasoning from the major premise to a conclusion, without necessarily making explicit all the elements involved in the final statement or opinion.

In one sense authority and scientific method may be harmonized. It is conceivable that the major premises of an authority may be based on scientific studies which have produced demonstrable truths. Deductions made with these truths as major premises and with strict adherence to the principles of logic should be valid.

1. Scientific method has been encouraged

   A. for many centuries.
   B. continuously.
   C. recently.
   D. by authoritarians.

2. "Authority" as used in line 15 of the above article, means
   A. traditional wisdom.
   B. scientific analysis.
   C. inductively determined fact.
   D. superstition.

3. Deductive reasoning assumes the accuracy of
   A. conclusions.
   B. major premises.
   C. facts.
   D. a logical synthesis.

4. A central idea of the preceding article is that
   A. deductive methods are hard to apply.
   B. science and logic are opposed.
   C. facts and opinions are about the same thing.
   D. scientific and authoritarian methods may complement each other.

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5. Which of the four paragraphs is primarily concerned with comparison?
   A. 1st
   B. 2nd
   C. 3rd
   D. 4th

6. Which of the four paragraphs is primarily concerned with synthesis?
   A. 1st
   B. 2nd
   C. 3rd
   D. 4th.

Please turn over and continue.

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All plays must leave out certain facts of life and aspects of human nature; there is not room in a play for everything, nor does the nature of the form demand that there should be. We do not, for instance, ask for the element of probability in a farce, or in a light comedy. We do not expect restraint and common-sense in a tragedy; for if they were present there would be no tragedy. In brief, we expect an author to leave bits of human nature out - to present an artificial concoction rather than a true-to-life one. We ask only that he make this artifice seem plausible; that is to say, if he does his work well, we should not notice the elements he has left out - and the more we do notice their absence, the more unimpressed we are by his skill. Of course, we value most highly the dramatists who manage to include the maximum of elements with the minimum of clumsiness; for we reckon, quite correctly, that a play is both more plausible and more interesting if the characters involved in it are full, like Brutus, of mixed elements and must struggle inside themselves to reach conclusions and perform big actions: this is at least partly what we mean when we say that Shakespeare embraces all humanity, or that characters are "whole" persons rather than bitty cut-outs. When things are made too plain-sailing for characters - when they represent only ambition, or only pride, or only greed, and have no opposites to these in them to make decisions hard for them - then we may accept them as absurd or melodramatic characters, or even as a certain sort of stylised particulars, but we cannot respond to them as fully as we can to Macbeth, or Lear, or Tartuffe, or the people in Chekhov. They are doubtful to us because they have no doubt themselves.

7. Plays must
   A. imitate life.
   B. select from life.
   C. exercise restraint.
   D. use common sense.

8. A play designed to produce laughter is expected to portray incidents which are
   A. natural.
   B. improbable.
   C. true-to-life.
   D. elementary.

9. The conviction which a play carries depends on our not being aware of
   A. its plausibility.
   B. the maximum of elements.
   C. the things left out.
   D. the mixture of characters.

10. Characters appear absurd or doubtful to us if they contain no
   A. ambition.
   B. style.
   C. inconsistencies.
   D. stylised peculiarities.

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11. The writer of this passage is trying to present
    A. a point of view in literary criticism.
    B. a closely reasoned argument.
    C. a description of a set of facts.
    D. a theory of human nature.

12. Which of the following sentences in the paragraph first introduces an important new idea?
    A. 3rd
    B. 4th
    C. 5th
    D. 6th

13. What support does the author provide for the position that he is taking?
    A. Examples and illustrations.
    B. Common knowledge.
    C. A series of investigations.
    D. Essentially no support.

Please turn over and continue.

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The history of the discovery of the Peking man was exciting despite the fact that this time it was not a more or less accidental discovery but the result of systematic excavation. In 1927 some Swedish and American paleontologists were excavating on a hill near Peking. The hill was called the Hill of Chicken Bones because bones of small birds had been found on it. Then a man came by, watched the strange work going on and said that if the gentlemen were looking for the bones of dragons, he knew a place where they could find much bigger bones.

The man took them to a limestone cave which was about one kilometer away. In the summers of 1921 and 1923 a lot of bones of big mammalia were found there. They were typical of the Quarternary fauna. Along with the bones some sharp-edged pieces of quartz were found which could be thought to be elementary tools. The professor who led the research work could not give up his idea that in the light of these discoveries it would be possible to find remains of primitive man on the continent of Asia. In 1927 excavations were started in the cave of Tsou-kou-tien but the whole summer passed without any discoveries. Finally, three days before winter stopped the field-work one tooth of a man was found.

It was a molar tooth of a lower jaw. After examining it very carefully one of the researchers came to the conclusion that the tooth did not belong to any known type of man, nor to any living race. On the basis of this one tooth the researcher named not only a new species of man but also a new race, the Chinese man.

14. On the basis of what find was the important conclusion described in the passage made?
   A. A molar tooth.
   B. Some tools.
   C. Some bones of birds.
   D. Some pieces of quartz.

15. The conclusion that the research worker reached is based upon the assumption that one can
   A. describe a human culture from the tools it used.
   B. find human remains by digging in the right places.
   C. make faster progress searching systematically than hunting blindly.
   D. accurately reconstruct a complete creature from one small part.

16. The basic pattern of the organization of this passage is
   A. logical.
   B. chronological.
   C. from general to specific.
   D. from specific to general.

17. What led the scientist to believe that he would find evidence of primitive man on the continent of Asia?
A. A molar tooth from a lower jaw.
B. Mammalian bones and sharp-edged pieces of quartz.
C. The statement of the Chinese about dragon bones.
D. The excavations at the Hill of Chicken Bones.

18. The author of this passage is primarily interested in
A. telling an entertaining story.
B. describing a series of events.
C. influencing the beliefs and feelings of his readers.
D. proving a scientific theory.

19. The bones that the investigators first found when they started digging in the cave had come from early forms of animals like
A. horses, bears, or tigers.
B. dragons.
C. small birds.
D. dinosaurs.

Please turn over and continue.

[illegible]

[illegible]

[illegible]

[illegible]

21. The "Five Fives of profit" refers to
    a. [illegible]
    b. [illegible]
    c. [illegible]
    d. [illegible]

22. Why would the work of a housewife in her home not be considered part of the national income?
    a. [illegible]
    b. [illegible]
    c. [illegible]
    d. [illegible]

23. Why would a shareholder conclude that a business concern he invested in for profit became even though not from an industrial point of?
    a. [illegible]
    b. [illegible]
    c. [illegible]
    d. [illegible]

24. In what respects would the use of a cement mixture be considered part of the national income while the receipt of a mortgage on the street cannot be [illegible] which one?
    a. [illegible]
    b. [illegible]
    c. [illegible]
    d. [illegible]

25. A businessman who makes fine furniture in his spare time as a hobby, having used in his house and giving some to friends. To what extent should his products be included from the national income?
    a. Part of the product is consumed within the home.
    b. To what transaction is involved.
    c. The motive for the production is not economic.
    d. The cost of the furniture had already been counted as national income.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[redacted]

[illegible]

[illegible]

[illegible]

[illegible]

Effective thinking, while starting with logic, goes further so as to include certain broad mental skills. It includes the understanding of complex and fluid situations, in dealing with which logical methods are inadequate as mental tools. Of course, thinking must never violate the laws of logic, but it may use techniques beyond those of exact mathematical reasoning. In the fields of social study and history, and in the problems of daily life, there are large areas where evidence is incomplete and may never be completed. Sometimes the evidence may be also untrustworthy; but if the situation is practical, a decision must be made. The scientist has been habituated to deal with properties which can be abstracted from their total background and with variables which are few and well defined. Consequently, where the facts are unique and unpredictable, where the variables are numerous and their interactions too complicated for precise calculation, the scientist is apt to throw up his hands in despair and perhaps turn the situation over to the sentimentalists or the mystic. But surely he would be wrong to ignore both this type of problem and this type of thinking; for the methods of logical thinking do not exhaust the resources of reason. In coping with complex and fluid situations we need thinking which is relational and which searches for cross bearings between areas; this is thinking in a context. By its use it is possible to reach an understanding of historical and social materials and of human relations, although not with the same degree of precision as in the case of simpler materials and recurring events. As Aristotle says, "It is the mark of an educated man to expect no more exactness than the subject permits."

15. The author believes complex practical problems can be solved
    A. by the use of logic alone.
    B. only if the rules of logic are disregarded.
    C. only if all the facts are known.
    D. only by using both logical and non-logical reasoning.

16. The author implies that mathematical reasoning is likely to be employed with advantage
    A. when the situations to be dealt with are complex and fluid.
    B. in history, social study, and the problems of everyday life.
    C. in stable, clear-cut situations, where there are few unknown or varying factors.
    D. in dealing with practical problems.

17. The author believes scientists should widen their field of work by undertaking problems that are
    A. less specific and less precise.
    B. more exact.
    C. more abstract.
    D. less complex and fluid.

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18. "Relational thinking" is principally of advantage in
    A. providing working solutions to problems for which the calculation of exact answers is impossible.
    B. dealing with problems for which only an approximate answer is desired.
    C. providing exact answers to ill-defined problems.
    D. dealing with problems related in thought.

19. The author's purpose in this passage is primarily to present
    A. a philosophical point of view.
    B. some important information.
    C. a piece of effective literary composition.
    D. a cleverly conceived argument.

20. In speaking of "thinking which is relational", (line 22) the author is contrasting this with
    A. exact mathematical reasoning.
    B. thinking that violates the laws of logic.
    C. intuitive approaches to human problems.
    D. Aristotle's point of view.

21. That one should expect no more exactness than the subject permits is endorsed by
    A. only the author.
    B. only Aristotle.
    C. the author and Aristotle.
    D. the author and traditional scientists.

Please turn over and continue.

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The next 100 years were destined to be the most fertile in the history of horology, because the foundations of nearly all the basic inventions appeared during this period. Robert Hooke, one of the great pioneers, is credited with the invention of the anchor escapement about 1666. This consisted of an anchor-shaped piece of steel, the points of which spanned several teeth of a sharp-toothed gear wheel. When this anchor rocked on a properly placed pivot, it allowed one tooth of the gear wheel to escape at each side of its swing, and the act of blocking the opposite tooth gave sufficient impulse to keep the pendulum swinging. This was a great step in advance in accuracy, and the majority of existing clocks were changed from foliot and verge to anchor escapement. Hooke contributed greatly to the mathematics of horology, and also invented the cylinder escapement which has endured to modern times, becoming the standard escapement for low-priced Swiss watches. As early as 1525, one John Leck of Prague had made a clock having a soft metal fusee. It remained, however, for Hooke to investigate scientifically the various properties of springs which included the fusee. He reinvented and described the fusee, which consisted of cutting a spiral on a conical drum attached to the first wheel. On this was wound first a piece of catgut and later a small chain, the other end of which was fastened to the cylindrical periphery of the barrel containing the main spring. The spiral was arranged so that the large diameter of the spiral was opposite the run-down position of the main spring. That meant that when the watch was fully wound the main spring, through its chain, was pulling on the small diameter of the spiral and, as the mechanism ran down and the tension of the main spring decreased, it was continually pulling on a larger radius, thereby tending to maintain a more constant power on the train and thus helping the mechanism to run at a more constant rate.

George Graham perfected Hooke's anchor escapement by broadening the face of the teeth on the anchor from Hooke's sharp points. This slight broadening prevented the escapement from swinging a little too far at each end of its swing, which can be detected in anchor escapement clocks by the tendency of the seconds hand to recoil slightly at each second. Graham's addition of the slight flats prevented this tendency; the deadbeat escapement did not have this overtravel and is the most common in modern use. This slight change was one of the most important steps in perfecting the time-keeping capabilities of the clock mechanism. Graham realised that temperature would change the length of the pendulum and hence have considerable influence on the rate of a clock. It has since been shown that 1 degree F. change in temperature of the steel rod of a seconds pendulum is equivalent to approximately four seconds in 24 hours, a brass rod, about twice as much; and a glass one, about half as much. Knowing roughly these facts, Graham suggested a compound pendulum composed of steel and brass, and so arranged that the different rates of expansion would offset one another. He abandoned this however, in favor of the mercury reservoir which he invented in 1711 and which, up to the invention of invar and some of the newer alloys that have practically zero coefficient of expansion under heat, was the most accurate pendulum known.

22. A grooved cone of metal is used in
A. a fusee.
B. a cylinder escapement.
C. a foliot.
D. an improved pendulum.

23. The kind of escapement most common in modern clocks is called the
A. anchor escapement.
B. cylindrical escapement.
C. deadbeat escapement.
D. compound escapement.

24. Which of the following types of escapements is probably most economical to construct?
A. Compound.
B. Deadbeat.
C. Cylinder.
D. Single.

25. The "next 100 years" referred to in the first sentence began about
A. 1525
B. 1575
C. 1600
D. 1650

26. One could tell whether an old grandfather clock had an anchor escapement or a deadbeat escapement by
A. observing the movement of the second hand.
B. checking to see whether it has a compound pendulum.
C. examining the points of the teeth on the first wheel.
D. inspecting the mainspring for the presence of a catgut attachment.

27. The most accurate pendulum available in the 18th century was the
A. foliot and verge.
B. compound pendulum.
C. mercury reservoir pendulum.
D. invar alloy pendulum.

28. In a compound pendulum, the length of the brass rods is about
A. half that of the steel rods.
B. the same as that of the steel rods.
C. one and a half that of the steel rods.
D. twice that of the steel rods.

29. The gain from using a cone with a spiral cut into it was that this made possible
A. compensation for the effect of temperature changes.
B. adjustment for the changing size of the expanding spring.
C. replacement of a pendulum with a spring.
D. nearly uniform power as the spring ran down.

END OF SECTION D

DO NOT TURN OVER UNTIL YOU ARE TOLD TO DO SO